



Standard Specification for Crew Interface in Aircraft¹

This standard is issued under the fixed designation F3117; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers international standards for the crew interface aspects of airworthiness and design for aircraft. “Crew” includes flight crew and maintenance crew.

1.2 The applicant for a design approval must seek the individual guidance of their respective Civil Aviation Authority (CAA) body concerning the use of this standard as part of a certification plan. For information on which CAA regulatory bodies have accepted this standard (in whole or in part) as a means of compliance to their airworthiness regulations (hereinafter referred to as “the Rules”), refer to ASTM F44 webpage (www.ASTM.org/COMMITTEE/F44.htm) which includes CAA website links.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[F3060 Terminology for Aircraft](#)

[F3061 Specification for Systems and Equipment in Small Aircraft](#)

[F3064/F3064M Specification for Control, Operational Characteristics and Installation of Instruments and Sensors of Propulsion Systems](#)

2.2 *Code of Federal Regulations (CFR):*³

[14 CFR Part 23 Amendment 62](#)

3. Terminology

3.1 Refer to Terminology [F3060](#).

¹ This specification is under the jurisdiction of ASTM Committee F44 on General Aviation Aircraft and is the direct responsibility of Subcommittee F44.10 on General.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

³ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

4. Pilot / Occupant Compartment

4.1 Pilot Compartment:

4.1.1 For each pilot compartment, the compartment and its equipment must allow each pilot to perform flight crew duties without unreasonable concentration or fatigue.

4.1.2 For each pilot compartment, where the flight crew are separated from the passengers by a partition, there must be a means to facilitate two-way communication between flight crew and cabin occupants, such as an opening or openable window or door or other means.

NOTE 1—A single intercom port from passenger compartment to crew may suffice as other means. If an opening is not provided to allow visual verification of occupant compartment conditions, such as Oxygen System status in Specification [F3061](#), other indication means may be required for other systems.

4.1.3 If communication between flight crew and cabin occupants relies on electrical power, the one-way communication from the flight crew to the cabin occupants must be considered an essential electrical load.

4.2 Pilot Compartment View:

4.2.1 Each pilot compartment must be arranged with sufficiently clear and undistorted view to enable the pilot to safely taxi, takeoff, approach, land, and perform any maneuvers within the operating limitations of the aircraft.

4.2.2 Each pilot compartment must be free from glare and reflections that could interfere with the pilot’s vision. Compliance must be shown in all operations for which certification is requested.

4.2.3 Each pilot compartment must be designed so that each pilot is protected from the elements so that moderate rain conditions do not unduly impair the pilot’s view of the flight path in normal flight and while landing.

5. Controls – General

5.1 Flight Control Systems Controls:

5.1.1 Each control must operate easily, smoothly, and positively enough to allow proper performance of its functions.

5.1.2 Controls must be arranged and, except where their function is obvious, identified to provide for convenience in operation and to not create confusion and subsequent inadvertent operation.

5.1.3 Airplane aerodynamic flight controls must be designed so that they operate in accordance with the following movement and actuation for aerodynamic controls:

(1) Primary Controls	Motion and effect
Roll	Right (clockwise) for right wing down.
Pitch	Rearward for nose up.
Yaw	Right pedal forward for nose right.
(2) Secondary Controls	
Flaps (or auxiliary lift devices)	Forward or up for flaps up or auxiliary device stowed; rearward or down for flaps down or auxiliary device deployed.
Trim tabs (or equivalent)	Switch motion or mechanical rotation or control to produce similar rotation of the airplane about an axis parallel to the axis control. Axis of roll trim control may be displaced to accommodate comfortable actuation by the pilot. Direction of pilot's hand movement must be in the same sense as airplane response for rudder trim if only a portion of a rotational element is accessible.

5.2 Cockpit Controls:

5.2.1 Each cockpit control must be located and, except where its function is obvious, identified to provide convenient operation and to not create confusion or be prone to inadvertent operation.

5.2.2 The controls must be located and arranged so that the pilot, in the normal seated position in the cockpit, has full and unrestricted movement of each control without interference from either clothing or cockpit structure.

5.2.3 Detents are an acceptable means to establish control positions associated with particular actions.

5.2.4 Powerplant controls must be located:

5.2.4.1 For multiengine airplanes, powerplant controls must be located on the pedestal or overhead at or near the center of the cockpit.

5.2.4.2 For single and tandem seated single-engine airplanes, powerplant controls must be located on the left side of the console or instrument panel.

5.2.4.3 For other single-engine airplanes, powerplant controls must be located at or near the center of the cockpit, on the pedestal, instrument panel, or overhead.

5.2.4.4 For airplanes with side-by-side pilot seats and with two sets of powerplant controls, powerplant controls must be located on the left and right consoles.

5.2.5 When separate and distinct control levers are co-located (such as located together on the pedestal), the control location order from left to right must be power (thrust) lever, propeller (rpm control), and mixture control (condition lever and fuel cut-off for turbine-powered airplanes).

5.2.5.1 Power (thrust) levers must be easily distinguishable from other controls, and provide for accurate, consistent operation.

5.2.5.2 Carburetor heat or alternate air control must be to the left of the throttle or at least 8 in. from the mixture control when located other than on a pedestal.

5.2.5.3 Carburetor heat or alternate air control, when located on a pedestal, must be aft or below the power (thrust) lever.

5.2.5.4 Supercharger controls must be located below or aft of the propeller controls.

5.2.5.5 Airplanes with tandem seating or single-place airplanes may utilize control locations on the left side of the cabin

compartment; however, location order from left to right must be power (thrust) lever, propeller (rpm control), and mixture control.

5.2.6 Identical powerplant controls for each engine must be located to prevent confusion as to the engines they control.

5.2.6.1 Conventional multiengine powerplant controls must be located so that the left control(s) operates the left engine(s) and the right control(s) operates the right engine(s).

5.2.6.2 On twin-engine airplanes with front and rear engine locations (tandem), the left powerplant controls must operate the front engine and the right powerplant controls must operate the rear engine.

5.2.7 Wing flap and auxiliary lift device controls.

5.2.7.1 Wing flap and auxiliary lift device controls must be located centrally, or to the right of the pedestal or powerplant throttle control centerline.

5.2.7.2 Wing flap and auxiliary lift device controls must be located far enough away from the landing gear control to avoid confusion.

5.2.8 The landing gear control must be located to the left of the throttle centerline or pedestal centerline.

5.2.9 If nose/tail wheel steering is installed, it must be demonstrated that its use does not require exceptional pilot skill during takeoff and landing, in crosswinds, or in the event of an engine failure, or its use must be limited to low speed maneuvering.

5.2.10 Each fuel feed selector control must be located and arranged so that the pilot can see and reach it without moving any seat or primary flight control or requiring undue or disorienting head/body movement when his seat is at any position intended for use in flight.

5.2.10.1 For a mechanical fuel selector:

(1) The indication of the selected fuel valve position must be by means of a pointer and must provide positive identification and feel (detent, etc.) of the selected position.

(2) The position indicator pointer must be located at the part of the handle that is the maximum dimension of the handle measured from the center of rotation.

5.2.10.2 For electrical or electronic fuel selector:

(1) Digital controls or electrical switches must be properly labeled.

(2) Means must be provided to indicate to the flight crew the tank or function selected. Selector switch position is not acceptable as a means of indication. The "off" or "closed" position must be indicated in red.

5.2.10.3 If the fuel valve selector handle or electrical or digital selection is also a fuel shut-off selector, the off position marking must be colored red.

5.2.10.4 If there is a selector position other than "off" that does not provide adequate fuel flow for normal engine operation, these positions must be indicated in red and/or a red annunciation must be provided to the pilot.

5.2.10.5 If a separate emergency shut-off means is provided, it must be colored red.

5.2.11 Ignition Switches.

5.2.11.1 Ignition switches must control each ignition circuit on each engine.

5.2.11.2 Ignition switches must shut off each ignition circuit on each engine.

5.2.11.3 There must be means to quickly shut off all ignition on multiengine airplanes by the groupings of switches or by a master ignition control.

5.2.11.4 Each group of ignition switches, except ignition switches for turbine engines for which continuous ignition is not required, must have a means to prevent its inadvertent operation.

5.2.11.5 Each master ignition control must have a means to prevent its inadvertent operation.

5.2.12 If there are mixture controls, each mixture control must have guards or must be shaped and arranged to prevent confusion by feel with other controls.

5.2.12.1 The mixture controls must be grouped and arranged to allow:

- (1) Separate control of each engine, and
- (2) Simultaneous control of all engines.

5.2.13 Propeller Speed and Pitch Controls.

5.2.13.1 If there are propeller speed or pitch controls, they must be grouped and arranged to allow separate control of each propeller.

5.2.13.2 If there are propeller speed or pitch controls, they must be grouped and arranged to allow simultaneous control of all propellers.

5.2.13.3 The controls must allow ready synchronization of all propellers on multiengine airplanes.

5.3 *Motion and Effect of Cockpit Controls:*

5.3.1 Cockpit controls must be designed so that they operate in accordance with the following movement and actuation for powerplant and auxiliary controls:

(1) Powerplant Controls	Motion and effect
Power (thrust lever)	Forward to increase forward thrust and rearward to increase rearward thrust (Note: The intent of this does not preclude the use of stacked (or "piggy-back") thrust reverser levers).
Propellers	Forward to increase rpm.
Mixture	Forward or upward for rich.
Fuel	Forward for open.
Carburetor, air heat or alternate air	Forward or upward for cold.
Forced air induction systems	Forward, upward, or clockwise to increase pressure.
Rotary controls	Clockwise from off to full on.
(2) Auxiliary Controls	
Fuel tank selector	Right for right tanks, left for left tanks.
Landing gear	Down to extend.
Speed brakes, Spoilers	Aft to extend.

5.4 *Cockpit Control Knob Shape:*

5.4.1 Flap and landing gear control knobs must conform to the general shapes (but not necessarily the exact sizes or specific proportions) in Fig. 1.

5.4.2 Powerplant control knobs must conform to the general shapes (but not necessarily the exact sizes of specific proportions) in Fig. 2.

5.5 *Circuit Breakers and Fuses:*

5.5.1 If the ability to reset a circuit breaker is essential to safety in flight, the circuit breaker must be located so that it can be readily reset in flight.

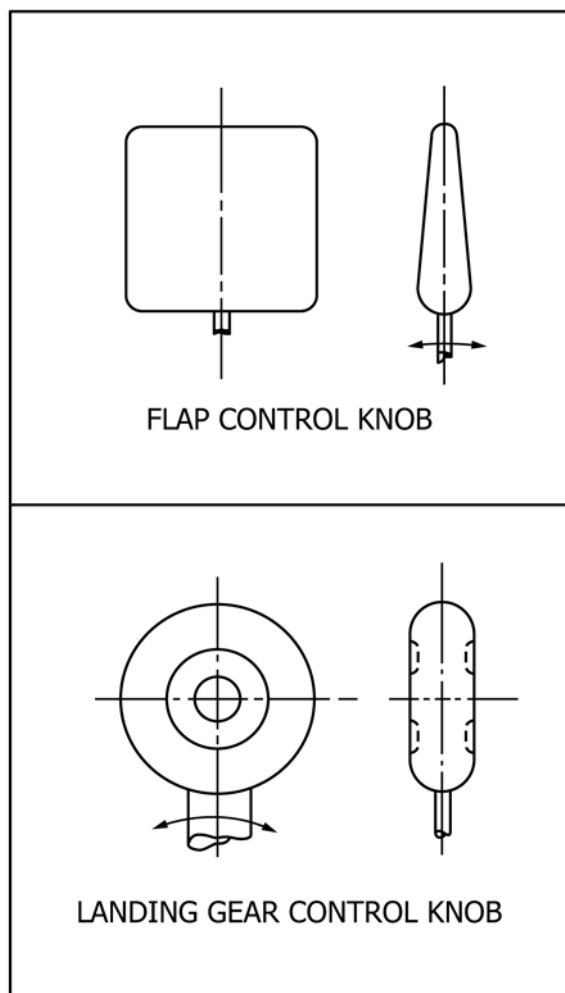


FIG. 1 Flap and Landing Gear Control Knobs

5.5.2 If the ability to reset a circuit breaker is essential to safety in flight, the circuit breaker must be labeled as to its function so it can be readily reset in flight.

5.5.3 For fuses identified as replaceable in flight, the spare fuse(s) must be readily accessible to a required pilot.

5.6 *Master Switch Arrangement:*

5.6.1 If separate switches are incorporated into the master switch arrangement, a means must be provided for the switch arrangement to be operated by one hand with a single movement.

5.6.2 The master switch or its controls must be so installed that the switch is easily discernible and accessible to a crewmember.

5.7 *Switches:*

5.7.1 Each switch must be accessible to appropriate flight crew members.

5.7.2 Each switch must be labeled as to operation and the circuit controlled.

6. **Flight Control Augmentation and Auto Flight System**

6.1 *Automatic Pilot Systems:*

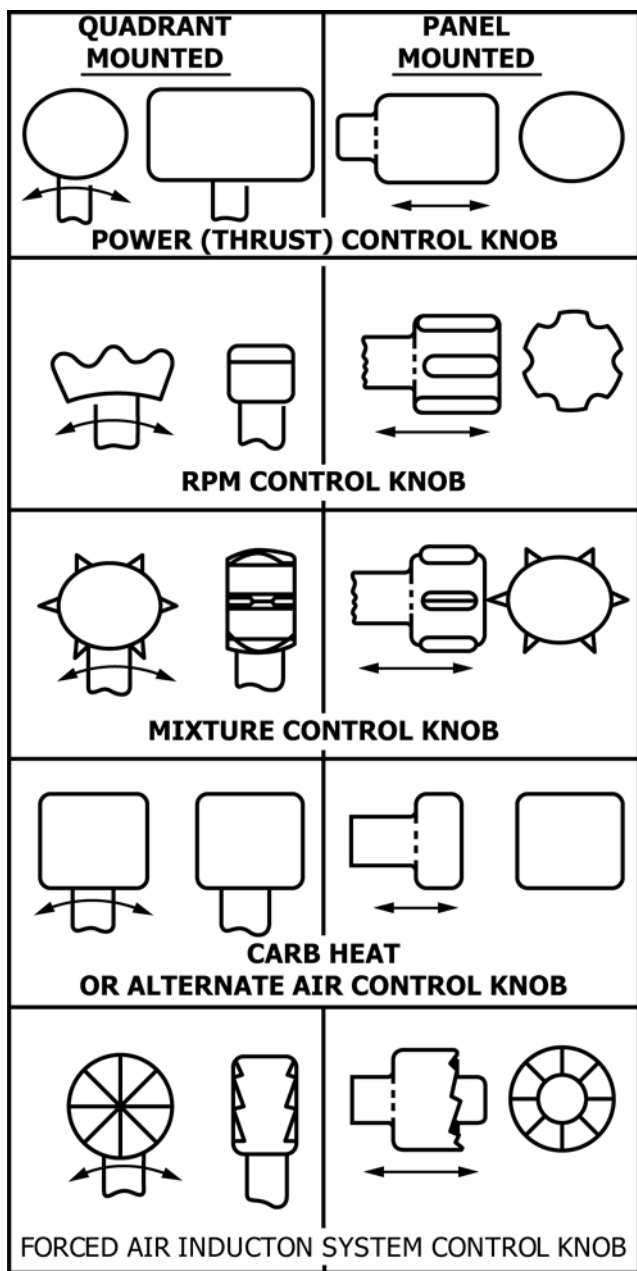


FIG. 2 Powerplant Control Knobs

6.1.1 If an automatic pilot system is installed, unless there is automatic synchronization, there must be an indication to the pilot showing the alignment of the actuating device in relation to the control system it operates.

6.1.2 Automatic Pilot Controls.

6.1.2.1 If an automatic pilot system is installed, each manually operated control for the system operation must be readily accessible to the pilot.

6.1.2.2 If an automatic pilot system is installed, each control must operate in the same plane and sense of motion as specified in Section 5.1.3 for cockpit controls.

6.1.2.3 If an automatic pilot system is installed, the direction of motion must be plainly indicated on or near each control.

6.1.3 If an automatic pilot system is installed and can be coupled to airborne navigation equipment, there must be an indication to the flight crew showing the current mode of operation. Selector switch position is not acceptable as a means of indication.

7. Displays – General

7.1 Instrument Arrangement and Visibility:

7.1.1 Each flight, navigation, and powerplant instrument for use by any required pilot during takeoff, initial climb, final approach, and landing must be located so that any pilot seated at the controls can monitor the aircraft's flight path and these instruments with minimum head and eye movement.

7.1.1.1 The powerplant instruments for these flight conditions are those needed to set power within powerplant limitations.

7.1.2 For each aircraft, the flight instruments required by Flight and Navigation Instruments in Specification F3061, and, as applicable, by the operating rules of the applicable Civil Aviation Authority (CAA), must be grouped on the instrument panel and centered as nearly as practicable about the vertical plane of each required pilot's forward vision.

7.1.2.1 The instrument that most effectively indicates the attitude must be on the panel in the top center position.

7.1.2.2 The instrument that most effectively indicates airspeed must be adjacent to and directly to the left of the instrument in the top center position.

7.1.2.3 The instrument that most effectively indicates altitude must be adjacent to and directly to the right of the instrument in the top center position.

7.1.2.4 The instrument that most effectively indicates direction of flight, other than the magnetic direction indicator required by Flight and Navigation Instruments in Specification F3061, must be adjacent to and directly below the instrument in the top center position.

7.1.3 Electronic display indicators may be used for compliance with Flight and Navigation Instruments in Specification F3061, when such displays comply with requirements in 8.1 and Electronic Display Instrument Systems in Specification F3061.

7.1.4 For each multiengine airplane, identical powerplant instruments must be located so as to prevent confusion as to which engine each instrument relates.

7.1.5 If a visual indicator is provided to indicate malfunction of an instrument, it must be effective under all probable cockpit lighting conditions.

7.2 Instrument Lights:

7.2.1 A cabin dome light is not considered an instrument light.

NOTE 2—The purpose of instrument lights is to allow the flight crew to see, locate, and identify information on displays and/or interact with controls under all lighting conditions. A cabin dome light intended to light the inside of the cabin is not considered an instrument light. However, an instrument light can be designed such that it also lights the inside of the cabin. Lights designed this way can be considered instrument lights.

7.2.2 The instrument lights must make each instrument and control easily readable and discernible.

7.2.3 The instrument lights must be installed so that their direct rays, and rays reflected from the windshield or other surface, are shielded from the pilot's eyes.

8. Primary Flight Information Displays

8.1 *Electronic Display Instrument Systems:*

8.1.1 Electronic display indicators, including those with features that make isolation and independence between powerplant instrument systems impractical, must be easily legible under all lighting conditions encountered in the cockpit, including direct sunlight, considering the expected electronic display brightness level at the end of an electronic display indicator's useful life.

8.1.1.1 Specific limitations on display system useful life must be contained in the Instructions for Continued Airworthiness required by 12.1.

8.1.2 Electronic display indicators, including those with features that make isolation and independence between powerplant instrument systems impractical, must incorporate equivalent visual displays of the instrument markings required by 13.2 through 13.7, or visual displays that alert the pilot to abnormal operational values or approaches to established limitation values, for each parameter required to be displayed.

9. Primary Flight Guidance

9.1 *Flight Director Systems*—If a flight director system is installed, means must be provided to indicate to the flight crew its current mode of operation. Selector switch position is not acceptable as a means of indication.

10. Communication and Audio Systems

10.1 *Electronic Communication Equipment:*

10.1.1 For those airplanes required to have more than one flightcrew member, or whose operation will require more than one flightcrew member, the cockpit must be evaluated to determine if the flightcrew members, when seated at their duty station, can converse without difficulty under the actual cockpit noise conditions when the airplane is being operated.

10.1.2 If the airplane design includes provision for the use of communication headsets, the evaluation must also consider conditions where headsets are being used.

10.1.3 If the evaluation shows conditions under which it will be difficult to converse, an intercommunication system must be provided.

11. Alerts

11.1 *Pilot Alerts:*

11.1.1 Information concerning an unsafe system operating condition must be provided in a timely manner to the crew to enable them to take appropriate corrective action.

11.1.1.1 The information required by 11.1.1 must be presented as an appropriate alert if immediate pilot awareness and immediate or subsequent corrective action is required.

11.1.1.2 The assessment discussed in System Safety Requirements in Specification F3061 must be used to determine what failure conditions would become "unsafe system operating conditions" if the crew failed to take any action or observe appropriate precautions. Refer to terminology in Specification F3061.

11.1.1.3 For purposes of this requirement, an alert is considered appropriate if it can be shown to effectively alert the flight crew to the potential unsafe system operating condition in a timely fashion. The particular method of indication would depend on the urgency and need for flight crew awareness or action that is necessary for that particular failure. Inherent aircraft and/or system characteristics may be used in lieu of dedicated indications and annunciations if they can be shown to be timely and effective.

11.1.1.4 Even if aircraft operation or performance is unaffected or insignificantly affected at the time of failure, information to the flight crew is required if it is considered necessary for the flight crew to take any immediate or subsequent action or observe any precautions.

11.1.1.5 If aircraft operation or performance is unaffected or insignificantly affected, information and alerting indications may be inhibited during specific phases of flight where informing the crew is considered more hazardous than not informing them.

11.1.2 Systems and controls, including indications and annunciations, must be designed to minimize crew errors which could create additional hazards.

11.1.3 If provisions for the use of communication headsets are provided, it must be demonstrated that the flightcrew members will receive all required aural alerts under the actual cockpit noise conditions when the aircraft is being operated when any headset is being used.

NOTE 3—All aural alerts need to be evaluated with and without headsets to assess their effectiveness and acceptability under all ambient noise conditions that may be encountered in the operational environment. There have been problems created by using active noise reduction headsets in older cockpits that have an alert sounded only in the cabin and not in the cockpit. The aircraft evaluations should also include the examination of an active noise reduction (ANR) system if it is going to be used on the airplane. Regardless of the method chosen to present auditory alerts, they should be easily detected and quickly understood in all ambient noise conditions.

11.2 *Warning, Caution, and Advisory Lights or Indicators:*

11.2.1 If warning, caution, or advisory lights are installed in the cockpit, they must, unless otherwise approved by the Certifying Authority, meet the requirements of 11.2.1.1 through 11.2.1.6.

11.2.1.1 Warning lights (lights indicating a hazard which may require immediate corrective action) must be red.

11.2.1.2 Caution lights (lights indicating the possible need for future corrective action) must be yellow/amber.

11.2.1.3 Safe operation lights must be green.

11.2.1.4 Lights not described in 11.2.1.1 through 11.2.1.3 may be any other color, including white, provided the color differs sufficiently from the colors prescribed in 11.2.1.1 through 11.2.1.3 to avoid possible confusion.

11.2.1.5 Colors used per 11.2.1.4 should be consistently applied so as not create confusion with that color used elsewhere in the flight deck.

11.2.1.6 All warning, caution, or advisory indications must be effective under all probable cockpit lighting conditions.

12. Continued Airworthiness and Maintenance

12.1 *Instructions for Continued Airworthiness:*

12.1.1 The applicant must prepare Instructions for Continued Airworthiness in accordance with 12.1.2 through 12.1.9 that are acceptable to the Certifying Authority.

NOTE 4—The instructions may be incomplete at type certification if a program exists to ensure their completion prior to delivery of the first airplane or issuance of a standard certificate of airworthiness, whichever occurs later.

12.1.2 The Instructions for Continued Airworthiness for each airplane must include the Instructions for Continued Airworthiness for each engine and propeller (hereinafter designated 'products'), for each appliance required by this chapter, and any required information relating to the interface of those appliances and products with the airplane.

12.1.3 If Instructions for Continued Airworthiness are not supplied by the manufacturer of an appliance or product installed in the airplane, the Instructions for Continued Airworthiness for the airplane must include the information essential to the continued airworthiness of the airplane.

12.1.4 The applicant must submit to the applicable Civil Aviation Authority (CAA) a program to show how changes to the Instructions for Continued Airworthiness made by the applicant or by the manufacturers of products and appliances installed in the airplane will be distributed.

12.1.5 The Instructions for Continued Airworthiness must be in the form of a manual or manuals as appropriate for the quantity of data to be provided.

12.1.6 The format of the manual or manuals must provide for a practical arrangement.

12.1.7 The contents of the manual or manuals must be prepared in the English language or other language acceptable to the Certifying Authority.

12.1.8 The Instructions for Continued Airworthiness must contain the following manuals or sections, as appropriate, and information:

12.1.8.1 Airplane maintenance manual or section.

(1) Introduction information that includes an explanation of the airplane's features and data to the extent necessary for maintenance or preventive maintenance.

(2) A description of the airplane and its systems and installations including its engines, propellers, and appliances.

(3) Basic control and operation information describing how the airplane components and systems are controlled and how they operate, including any special procedures and limitations that apply.

(4) Servicing information that covers details regarding servicing points, capacities of tanks, reservoirs, types of fluids to be used, pressures applicable to the various systems, location of access panels for inspection and servicing, locations of lubrication points, lubricants to be used, equipment required for servicing, tow instructions and limitations, mooring, jacking, and leveling information.

12.1.8.2 Maintenance Instructions.

(1) Scheduling information for each part of the airplane and its engines, auxiliary power units, propellers, accessories, instruments, and equipment that provides the recommended periods at which they should be cleaned, inspected, adjusted, tested, and lubricated, and the degree of inspection, the applicable wear tolerances, and work recommended at these

periods. However, the applicant may refer to an accessory, instrument, or equipment manufacturer as the source of this information if the applicant shows that the item has an exceptionally high degree of complexity requiring specialized maintenance techniques, test equipment, or expertise. The recommended overhaul periods and necessary cross reference to the Airworthiness Limitations section of the manual must also be included. In addition, the applicant must include an inspection program that includes the frequency and extent of the inspections necessary to provide for the continued airworthiness of the airplane.

(2) Troubleshooting information describing probable malfunctions, how to recognize those malfunctions, and the remedial action for those malfunctions.

(3) Information describing the order and method of removing and replacing products and parts with any necessary precautions to be taken.

(4) Other general procedural instructions including procedures for system testing during ground running, symmetry checks, weighing and determining the center of gravity, lifting and shoring, and storage limitations.

12.1.8.3 Diagrams of structural access plates and information needed to gain access for inspections when access plates are not provided.

12.1.8.4 Details for the application of special inspection techniques including radiographic and ultrasonic testing where such processes are specified.

12.1.8.5 Information needed to apply protective treatments to the structure after inspection.

12.1.8.6 All data relative to structural fasteners such as identification, discard recommendations, and torque values.

12.1.8.7 A list of special tools needed.

12.1.8.8 In addition, for Level 4 airplanes, the following information must be furnished:

(1) Electrical loads applicable to the various systems;

(2) Methods of balancing control surfaces;

(3) Identification of primary and secondary structures; and

(4) Special repair methods applicable to the airplane.

12.1.9 The Instructions for Continued Airworthiness must contain a section titled Airworthiness Limitations that is segregated and clearly distinguishable from the rest of the document.

12.1.9.1 This Airworthiness Limitations must set forth each mandatory replacement time, structural inspection interval, and related structural inspection procedure required for type certification.

12.1.9.2 If the Instructions for Continued Airworthiness consist of multiple documents, the Airworthiness Limitations must be included in the principal manual.

12.1.9.3 The Airworthiness Limitations must contain a legible statement in a prominent location that reads: "The Airworthiness Limitations is approved by the applicable Civil Aviation Authority (CAA), and specifies maintenance required under the governing Maintenance regulations and Operations regulations for Maintenance, Preventative Maintenance, Rebuilding, and Alteration, unless an alternative program has been approved by the applicable Civil Aviation Authority (CAA)."

13. Markings and Placards

13.1 *General:*

13.1.1 The airplane must contain the markings and placards specified in 13.3 through 13.13.

13.1.2 The airplane must contain any additional information, instrument markings, and placards required for the safe operation if it has unusual design, operating, or handling characteristics.

13.1.3 Each marking and placard prescribed in 13.1.1 and 13.1.2 must be displayed in a conspicuous place.

13.1.4 Each marking or placard prescribed in 13.1.1 and 13.1.2 may not be easily erased, disfigured, or obscured.

13.1.5 For airplanes which have multiple potential uses and/or capabilities, the applicant must select at least one use or capability upon which the placards and markings are to be based.

13.1.6 For airplanes which have multiple potential uses and/or capabilities, the placards and marking information for all categories in which the airplane is to be certificated must be furnished in the Airplane Flight Manual.

13.2 *Instrument Markings—General:*

13.2.1 For each instrument, when markings are on the cover glass of the instrument, there must be means to maintain the correct alignment of the glass cover with the face of the dial; and

13.2.2 For each instrument, each arc and line must be wide enough and located to be clearly visible to the pilot.

13.2.3 For each instrument, all related instruments must be calibrated in compatible units.

13.3 *Airspeed Indicator:*

13.3.1 Each airspeed indicator must be marked as specified in 13.3.2, with the marks located at the corresponding indicated airspeeds.

13.3.2 *Airspeed Indicator Markings.*

13.3.2.1 The airspeed indicator must be marked with a radial red line for the never-exceed speed V_{NE} .

13.3.2.2 For the caution range, the airspeed indicator must be marked with a yellow arc extending from the red line specified in 13.3.2.1 to the upper limit of the green arc specified in 13.3.2.3.

13.3.2.3 For the normal operating range, the airspeed indicator must be marked with a green arc with the lower limit at V_{S1} with maximum weight and with landing gear and wing flaps retracted, and the upper limit at the maximum structural cruising speed V_{NO} established under 14 CFR 23.1505(b).

13.3.2.4 For the flap operating range, the airspeed indicator must be marked with a white arc with the lower limit at V_{S0} at the maximum weight, and the upper limit at the flaps-extended speed V_{FE} established under 14 CFR 23.1511.

13.3.2.5 For low speed, Level 1 and 2 multiengine airplanes, the airspeed indicator must be marked with a blue radial line relating to V_{YSE} established under 14 CFR 23.69(b) relating to rate of climb at maximum weight and at sea level.

13.3.2.6 For low speed, Level 1 and 2 multiengine airplanes, the airspeed indicator must be marked with a red radial line for the maximum value of minimum control speed, V_{MC} .

13.3.3 If V_{NE} or V_{NO} vary with altitude, there must be means to indicate to the pilot the appropriate limitations throughout the operating altitude range.

13.3.4 Sections 13.3.2.1 through 13.3.2.4 and 13.3.3 do not apply to airplanes for which a maximum operating speed V_{MO}/M_{MO} is established under 14 CFR 23.1505(c). For those airplanes, there must either be a maximum allowable airspeed indication showing the variation of V_{MO}/M_{MO} with altitude or compressibility limitations (as appropriate), or a radial red line marking for V_{MO}/M_{MO} must be made at lowest value of V_{MO}/M_{MO} established for any altitude up to the maximum operating altitude for the airplane.

13.4 *Magnetic Direction Indicator:*

13.4.1 A placard meeting the requirements of this must be installed on or near the magnetic direction indicator.

13.4.2 The placard must show the calibration of the instrument in level flight with the engines operating.

13.4.3 The placard must state whether the calibration was made with radio receivers on or off.

13.4.4 Each calibration reading must be in terms of magnetic headings in not more than 30° increments.

13.4.5 If a magnetic nonstabilized direction indicator can have a deviation of more than 10° caused by the operation of electrical equipment, the placard must state which electrical loads, or combination of loads, would cause a deviation of more than 10° when turned on.

13.5 *Powerplant and Auxiliary Power Unit Instruments:*

13.5.1 For each required powerplant and auxiliary power unit instrument, as appropriate to the type of instruments, each maximum and, if applicable, minimum safe operating limit must be marked with a red radial or a red line;

13.5.2 For each required powerplant and auxiliary power unit instrument, as appropriate to the type of instruments, each normal operating range must be marked with a green arc or green line, not extending beyond the maximum and minimum safe limits;

13.5.3 For each required powerplant and auxiliary power unit instrument, as appropriate to the type of instruments, each takeoff and precautionary range must be marked with a yellow arc or a yellow line; and

13.5.4 For each required powerplant and auxiliary power unit instrument, as appropriate to the type of instruments, each engine, auxiliary power unit, or propeller range that is restricted because of excessive vibration stresses must be marked with red arcs or red lines.

13.6 *Oil Quantity Indicator*—Each oil quantity indicator must be marked in sufficient increments to indicate readily and accurately the quantity of oil.

13.7 *Fuel Quantity Indicator*—A red radial line must be marked on each indicator at the calibrated zero reading, as specified in Specification **F3064/F3064M**.

13.8 *Control Markings:*

13.8.1 Each cockpit control, other than primary flight controls and simple push button type starter switches, must be plainly marked as to its function and method of operation.

13.8.2 Each secondary control must be suitably marked.

13.8.3 *Powerplant Fuel Controls:*

13.8.3.1 Each fuel tank selector control must be marked to indicate the position corresponding to each tank and to each existing cross feed position;

13.8.3.2 If safe operation requires the use of any tanks in a specific sequence, that sequence must be marked on or near the selector for those tanks;

13.8.3.3 The conditions under which the full amount of usable fuel in any restricted usage fuel tank can safely be used must be stated on a placard adjacent to the selector valve for that tank; and

13.8.3.4 Each valve control for any engine of a multiengine airplane must be marked to indicate the position corresponding to each engine controlled.

13.8.4 *Usable Fuel Capacity Markings:*

13.8.4.1 For fuel systems having no selector controls, the usable fuel capacity of the system must be indicated at the fuel quantity indicator.

13.8.4.2 For fuel systems having selector controls, the usable fuel capacity available at each selector control position must be indicated near the selector control.

13.8.4.3 For fuel systems having a calibrated fuel quantity indication system complying with Specification **F3064/F3064M** and accurately displaying the actual quantity of usable fuel in each selectable tank, no fuel capacity placards outside of the fuel quantity indicator are required.

13.8.5 *For accessory, auxiliary, and emergency controls:*

13.8.5.1 If retractable landing gear is used, the indicator required by 14 CFR 23.729 must be marked so that the pilot can, at any time, ascertain that the wheels are secured in the extreme positions; and

13.8.5.2 Each emergency control must be red.

13.8.5.3 Each emergency control must be marked as to method of operation.

13.8.5.4 No control other than an emergency control, or a control that serves an emergency function in addition to its other functions, shall be red.

13.9 *Miscellaneous Markings and Placards:*

13.9.1 Each baggage and cargo compartment, and each ballast location, must have a placard stating any limitations on contents, including weight, that are necessary under the loading requirements.

13.9.2 If the maximum allowable weight to be carried in a seat is less than 77 kg (170 lb), a placard stating the lesser weight must be permanently attached to the seat structure.

13.9.3 *Fuel/Oil/Coolant Filler Openings:*

13.9.3.1 Fuel filler openings must be marked at or near the filler cover with:

(1) The permissible fuel designations, or references to the Airplane Flight Manual (AFM) for permissible fuel designations.

(2) For pressure fueling systems, the maximum permissible fueling supply pressure and the maximum permissible defueling pressure.

13.9.3.2 Oil filler openings must be marked at or near the filler cover with the word “Oil” and the permissible oil designations, or references to the Airplane Flight Manual (AFM) for permissible oil designations.

13.9.3.3 Coolant filler openings must be marked at or near the filler cover with the word “Coolant”.

13.9.4 Each placard and operating control for each emergency exit must be red.

13.9.5 A placard must be near each emergency exit control and must clearly indicate the location of that exit and its method of operation.

13.9.6 The system voltage of each direct current installation must be clearly marked adjacent to its external power connection.

13.10 *Operating Limitations Placard:*

13.10.1 There must be a placard in clear view of the pilot stating that the airplane must be operated in accordance with the Airplane Flight Manual.

13.10.2 There must be a placard in clear view of the pilot that specifies the kind of operations to which the operation of the airplane is limited or from which it is prohibited under 14 CFR 23.1525.

13.10.3 For airplanes certificated for multiple kinds of operations, there must be a placard in clear view of the pilot stating that other limitations are contained in the Airplane Flight Manual.

13.10.4 The placard(s) required by this need not be lighted.

13.11 *Safety Equipment:*

13.11.1 Safety equipment must be plainly marked as to method of operation.

13.11.2 Stowage provisions for required safety equipment must be marked for the benefit of occupants.

13.12 *Airspeed Placards*—There must be an airspeed placard in clear view of the pilot and as close as practicable to the airspeed indicator.

13.12.1 The airspeed placard must list the operating maneuvering speed V_O .

13.12.2 The airspeed placard must list the maximum landing gear operating speed V_{LO} .

13.12.3 For multiengine airplanes, the airspeed placard must list the maximum value of the minimum control speed, V_{MC} (one-engine-inoperative) determined under 14 CFR 23.149(b).

13.12.4 The airspeed placard(s) required by this need not be lighted if the landing gear operating speed is indicated on the airspeed indicator or other lighted area such as the landing gear control and the airspeed indicator has features such as low speed awareness that provide ample warning prior to V_{MC} .

13.13 *Flight Maneuver Placard:*

13.13.1 For airplanes not approved for acrobatic maneuvers, there must be a placard in front of and in clear view of the pilot stating flight maneuver information or limitations. (e.g., “No acrobatic maneuvers, including spins, approved”, “Acrobatic maneuvers are limited to the following ...”, “Spins Prohibited”, “Approved acrobatic maneuvers and related airspeeds:”).

13.13.2 Airplanes approved for limited acrobatic maneuvers airplanes.

13.13.2.1 For airplanes approved for limited acrobatic maneuvers airplanes, there must be a placard in clear view of the

pilot stating: “Acrobatic maneuvers are limited to the following ...” (list approved maneuvers and the recommended entry speed for each); and

13.13.2.2 For those airplanes that do not meet spin requirements, an additional placard in clear view of the pilot stating: “Spins Prohibited.”

13.13.3 For airplanes approved for acrobatic maneuvers, there must be a placard in clear view of the pilot listing the approved acrobatic maneuvers and the recommended entry airspeed for each. If inverted flight maneuvers are not approved, the placard must bear a notation to this effect.

13.13.4 *Airplanes Approved for Spinning:*

13.13.4.1 For airplanes approved for spinning, there must be a placard in clear view of the pilot listing the control action for recovery from spinning maneuvers; and

13.13.4.2 For airplanes approved for spinning, there must be a placard in clear view of the pilot stating that recovery must be initiated when spiral characteristics appear, or after not more than six turns or not more than any greater number of turns for which the airplane has been certificated.

13.13.5 The placard(s) required by this need not be lighted.

14. Airplane Flight Manual and Approved Manual Material

14.1 *General:*

14.1.1 An Airplane Flight Manual must be furnished with each airplane.

14.1.1.1 The Airplane Flight Manual must contain the information required by 14 CFR 23.1583 through 23.1589.

14.1.1.2 The Airplane Flight Manual must contain other information that is necessary for safe operation because of design, operating, or handling characteristics.

14.1.1.3 The Airplane Flight Manual must contain further information necessary to comply with the relevant operating rules.

14.2 *Approved Information:*

14.2.1 Except as provided in 14.2.2, each part of the Airplane Flight Manual containing information prescribed in 14 CFR 23.1583 through 23.1589 must be approved, segregated, identified, and clearly distinguished from each unapproved part of that Airplane Flight Manual.

14.2.2 The requirements of 14.2.1 do not apply to low speed Level 1 and 2 airplanes, if the following is met:

14.2.2.1 Each part of the Airplane Flight Manual containing information prescribed in 14 CFR 23.1583 must be limited to such information, and must be approved, identified, and clearly distinguished from each other part of the Airplane Flight Manual.

14.2.2.2 The information prescribed in 14 CFR 23.1585 through 23.1589 must be determined in accordance with the applicable requirements of this part and presented in its entirety in a manner acceptable to the applicable Civil Aviation Authority (CAA).

14.2.3 Each page of the Airplane Flight Manual containing information prescribed in this must be of a type that is not easily erased, disfigured, or misplaced, and is capable of being inserted in a manual provided by the applicant, or in a folder, or in any other permanent binder.

14.2.4 The units used in the Airplane Flight Manual must be the same as those marked on the appropriate instruments and placards.

14.2.5 All Airplane Flight Manual operational airspeeds, unless otherwise specified, must be presented as indicated airspeeds.

14.2.6 Provisions must be made for stowing the Airplane Flight Manual in a suitable fixed container which is readily accessible to the pilot.

14.2.7 Revisions and amendments. Each Airplane Flight Manual (AFM) must contain a means for recording the incorporation of revisions and amendments.

14.3 *Operating Limitations*—The Airplane Flight Manual must contain operating limitations determined for the airplane.

14.3.1 Airspeed limitations. The following information must be furnished:

14.3.1.1 Information necessary for the marking of the airspeed limits on the indicator as required in 13.3 [23.1545], and the significance of each of those limits and of the color coding used on the indicator, must be furnished.

14.3.1.2 The speeds V_{MC} , V_O , V_{LE} , and V_{LO} , if established, and their significance, must be furnished.

14.3.1.3 In addition, for high speed Level 3 and Level 4 airplanes:

(1) The maximum operating limit speed, V_{MO}/M_{MO} must be furnished with a statement that this speed must not be deliberately exceeded in any regime of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training;

(2) If an airspeed limitation is based upon compressibility effects, a statement must be furnished to this effect and information as to any symptoms, the probable behavior of the airplane, and the recommended recovery procedures; and

(3) The airspeed limits must be shown in terms of V_{MO}/M_{MO} instead of V_{NO} and V_{NE} .

14.3.2 Powerplant limitations.

14.3.2.1 Powerplant limitations required by Specification **F3064/F3064M** must be furnished.

14.3.2.2 Explanation of the powerplant limitations must be furnished, when appropriate.

14.3.2.3 Information necessary for marking the instruments required by Specification **F3064/F3064M** must be furnished.

14.4 *Weight:*

14.4.1 The airplane flight manual must include the maximum takeoff and ramp weights.

14.4.2 The airplane flight manual must include the maximum landing weight, if the design landing weight selected by the applicant is less than the maximum takeoff and ramp weights.

14.4.3 For low speed, Level 3 airplanes, the airplane flight manual must include the performance operating limitations as follows:

14.4.3.1 The maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which the airplane complies with the climb requirements of 14 CFR 23.63(c)(1).

14.4.3.2 The maximum landing weight for each airport altitude and ambient temperature within the range selected by

the applicant at which the airplane complies with the climb requirements of 14 CFR 23.63(c)(2).

14.4.4 For high speed multiengine airplanes and Level 4 airplanes, the airplane flight manual must include the maximum takeoff weight for each airport altitude and ambient temperature within the range selected by the applicant at which:

14.4.4.1 The airplane complies with the climb requirements of 14 CFR 23.63(d)(1); and

14.4.4.2 The accelerate-stop distance determined under 14 CFR 23.55 is equal to the available runway length plus the length of any stopway, if utilized; and either:

(1) The takeoff distance determined under 14 CFR 23.59(a) is equal to the available runway length; or

(2) At the option of the applicant, the takeoff distance determined under 14 CFR 23.59(a) is equal to the available runway length plus the length of any clearway and the takeoff run determined under 14 CFR 23.59(b) is equal to the available runway length.

14.4.5 For high speed multiengine airplanes and Level 4 airplanes, the airplane flight manual must include the maximum landing weight for each airport altitude within the range selected by the applicant at which:

14.4.5.1 The airplane complies with the climb requirements of 14 CFR 23.63(d)(2) for ambient temperatures within the range selected by the applicant; and

14.4.5.2 The landing distance determined under 14 CFR 23.75 for standard temperatures is equal to the available runway length.

14.4.6 The airplane flight manual must include the maximum zero wing fuel weight, where relevant, as established in accordance with 14 CFR 23.343.

14.5 *Center of Gravity*—The airplane flight manual must include the established center of gravity limits.

14.6 *Maneuvers*—The airplane flight manual must include a list of approved flight maneuvers demonstrated in the type flight tests, together with recommended entry speeds, recovery procedures, and any other associated limitations.

14.7 *Maneuver Load Factor*—The airplane flight manual must include the positive limit load factors in g's, and, in addition, the negative limit load factor for aerobatic airplanes.

14.8 *Minimum Flight Crew*—The airplane flight manual must include the number and functions of the minimum flight crew.

14.9 *Kinds of Operation:*

14.9.1 The airplane flight manual must include a list of the kinds of operation to which the airplane is limited or from which it is prohibited under 14 CFR 23.1525.

14.9.2 The airplane flight manual must include a list of installed equipment that affects any operating limitation and identification as to the equipment's required operational status for the kinds of operation for which approval has been given.

14.10 *Maximum Operating Altitude*—The airplane flight manual must include the maximum altitude established under 14 CFR 23.1527.

14.11 *Maximum Passenger Seating Configuration*—The airplane flight manual must include the maximum passenger seating configuration.

14.12 *Allowable Lateral Fuel Loading*—The airplane flight manual must include the maximum allowable lateral fuel loading differential, if less than the maximum possible.

14.13 *Baggage and Cargo Loading*—The airplane flight manual must include the following information for each baggage and cargo compartment or zone:

14.13.1 The maximum allowable load; and

14.13.2 The maximum intensity of loading.

14.13.3 Systems. Any limitations on the use of airplane systems and equipment.

14.14 *Ambient Temperatures*—The airplane flight manual must include, where appropriate, maximum and minimum ambient air temperatures for operation.

14.15 *Smoking*—The airplane flight manual must include any restrictions on smoking in the airplane.

14.16 *Types of Surface*—The airplane flight manual must include a statement of the types of surface on which operations may be conducted. Refer to 14 CFR 23.45(g) and 14 CFR 23.1587(a)(4), (c)(2), and (d)(4)).

14.17 *Operating Procedures:*

14.17.1 For all airplanes, information concerning normal, abnormal (if applicable), and emergency procedures and other pertinent information necessary for safe operation and the achievement of the scheduled performance must be furnished.

14.17.1.1 The information provided in accordance with 14.17.1 must include an explanation of significant or unusual flight or ground handling characteristics;

14.17.1.2 The information provided in accordance with 14.17.1 must include the maximum demonstrated values of crosswind for takeoff and landing, and procedures and information pertinent to operations in crosswinds;

14.17.1.3 The information provided in accordance with 14.17.1 must include a recommended speed for flight in rough air. This speed must be chosen to protect against the occurrence, as a result of gusts, of structural damage to the airplane and loss of control (for example, stalling);

14.17.1.4 The information provided in accordance with 14.17.1 must include Procedures for restarting any turbine engine in flight, including the effects of altitude; and

14.17.1.5 The information provided in accordance with 14.17.1 must include procedures, speeds, and configuration(s) for making a normal approach and landing, in accordance with 14 CFR 23.73 and 14 CFR 23.75.

14.17.1.6 The information provided in accordance with 14.17.1 must include a transition to the balked landing condition.

14.17.1.7 For seaplanes and amphibians, the information provided in accordance with 14.17.1 must include water handling procedures and the demonstrated wave height.

14.17.2 In addition to 14.17.1, the procedures, speeds, and configuration(s) for a glide following engine failure, in accordance with 14 CFR 23.71 and the subsequent forced landing must be furnished for all single-engine airplanes.

14.17.3 In addition to 14.17.1, for all multiengine airplanes, the following information must be furnished:

14.17.3.1 Procedures, speeds, and configuration(s) for making and approach and landing with one engine inoperative;

14.17.3.2 Procedures, speeds, and configuration(s) for making a balked landing with one engine inoperative and the conditions under which a balked landing can be performed safely, or a warning against attempting a balked landing;

14.17.3.3 The VSSE determined in 14 CFR 23.149; and

14.17.3.4 Procedures for restarting any engine in flight including the effects of altitude.

14.17.4 In addition to sections 14.17.1 and either 14.17.2 or 14.17.3, as appropriate, for all Level 1, 2, and 3 airplanes, the following information must be furnished:

14.17.4.1 Procedures, speeds, and configuration(s) for making a normal takeoff, in accordance with 14 CFR 23.51(a)(b), and 14 CFR 23.53(a)(b), and the subsequent climb, in accordance with 14 CFR 23.65 and 14 CFR 23.69(a).

14.17.4.2 Procedures for abandoning a takeoff due to engine failure or other cause.

14.17.5 In addition to 14.17.1, 14.17.3, and 14.17.4, for all Level 1, 2, and 3 multiengine airplanes, the information must include the following:

14.17.5.1 Procedures and speeds for continuing a takeoff following engine failure and the conditions under which takeoff can safely be continued, or a warning against attempting to continue the takeoff.

14.17.5.2 Procedures, speeds, and configurations for continuing a climb following engine failure, after takeoff, in accordance with 14 CFR 23.67, or enroute, in accordance with 14 CFR 23.60(b).

14.17.6 In addition to 14.17.1 and 14.17.3, for high speed multiengine airplanes and Level 4 airplanes, the information must include the following:

14.17.6.1 Procedures, speeds, and configuration(s) for making a normal takeoff.

14.17.6.2 Procedures and speeds for carrying out an accelerate-stop in accordance with 14 CFR 23.55.

14.17.6.3 Procedures and speeds for continuing a takeoff following engine failure in accordance with 14 CFR 23.59(a)(1).

14.17.6.4 Procedures and speeds for following the flight path determined under 14 CFR 23.57 and 14 CFR 23.61(a).

14.17.7 For multiengine airplanes, information identifying each operating condition in which the fuel system independence prescribed in 14 CFR 23.953 is necessary for safety must be furnished, together with instructions for placing the fuel system in a configuration used to show compliance with that .

14.17.8 For each airplane showing compliance with 14 CFR 23.1353(g)(2) or (g)(3), the operating procedures for disconnecting the battery from its charging source must be furnished.

14.17.9 Information on the total quantity of usable fuel for each fuel tank, and the effect on the usable fuel quantity, as a result of a failure of any pump, must be furnished.

14.17.10 Procedures for the safe operation of the airplane's systems and equipment, both in normal use and in the event of malfunction, must be furnished.

14.18 *Performance Information*—Unless otherwise prescribed, performance information must be provided over the altitude and temperature ranges required by 14 CFR 23.45(b).

14.18.1 For all airplanes, the stalling speeds V_{S0} and V_{S1} with the landing gear and wing flaps retracted, determined at applicable maximum weight under 14 CFR 23.49, and the effect on these stalling speeds of angles of bank up to 60° in a level turn, must be furnished.

14.18.2 For all airplanes, the steady rate and gradient of climb with all engines operating, determined under 14 CFR 23.69(a) must be furnished.

14.18.3 For all airplanes, the landing distance, determined under 14 CFR 23.75 for each airport altitude and standard temperature, and the type of surface for which it is valid must be furnished.

14.18.4 For all airplanes, the effect on landing distances of operation on other than smooth hard surfaces, when dry, determined under 14 CFR 23.45(g) must be furnished.

14.18.5 For all airplanes, the effect on landing distances of runway slope and 50 % of the headwind component and 150 % of the tailwind component must be furnished.

14.18.6 For all airplanes, the steady angle of climb/descent, determined under 14 CFR 23.77(a), must be furnished.

14.18.7 In addition to Sections 14.18.1 through 14.18.6, if appropriate, for Level 1, 2, and 3 airplanes, the following must be furnished:

14.18.7.1 The takeoff distance, determined under 14 CFR 23.53, and the type of surface for which it is valid;

14.18.7.2 The effect on takeoff distance of operation on other than smooth hard surfaces, when dry, determined under 14 CFR 23.45(g);

14.18.7.3 The effect on takeoff distance of runway slope and 50 % of the headwind component and 150 % of the tailwind component;

14.18.7.4 For low speed, multiengine airplanes, the one-engine-inoperative takeoff climb/descent gradient, determined under 14 CFR 23.66;

14.18.7.5 For multiengine airplanes, the enroute rate and gradient of climb/descent with one engine inoperative, determined under 14 CFR 23.69(b); and

14.18.7.6 For single-engine airplanes, the glide performance determined under 14 CFR 23.71.

14.18.8 In addition to 14.18.1 through 14.18.5, for high speed multiengine airplanes and Level 4 airplanes, the following information must be furnished:

14.18.8.1 The accelerate-stop distance determined under 14 CFR 23.55;

14.18.8.2 The takeoff distance determined under 14 CFR 23.59(a);

14.18.8.3 At the option of the applicant, the takeoff run determined under 14 CFR 23.59(b);

14.18.8.4 The effect on accelerate-stop distance, takeoff distance and, if determined, takeoff run, of operation on other than smooth hard surfaces, when dry, determined under 14 CFR 23.45(g);

14.18.8.5 The effect on accelerate-stop distance, takeoff distance, and if determined, takeoff run, of runway slope and 50 % of the headwind component and 150 % of the tailwind component;

14.18.8.6 The net takeoff flight path determined under 14 CFR 23.61(b);

14.18.8.7 The enroute gradient of climb/descent with one engine inoperative, determined under 14 CFR 23.69(b);

14.18.8.8 The effect, on the net takeoff flight path and on the enroute gradient of climb/descent with one engine inoperative, of 50 % of the headwind component and 150 % of the tailwind component;

14.18.8.9 Overweight landing performance information (determined by extrapolation and computed for the range of weights between the maximum landing and maximum takeoff weights) as follows:

(1) The maximum weight for each airport altitude and ambient temperature at which the airplane complies with the climb requirements of 14 CFR 23.63(d)(2); and

(2) The landing distance determined under 14 CFR 23.75 for each airport altitude and standard temperature.

14.18.8.10 The relationship between IAS and CAS determined in accordance with Specification **F3061** [23.1323(b)(c)].

14.18.8.11 The altimeter system calibration required by Specification **F3061** [23.1325(e)].

14.19 *Loading Information:*

14.19.1 The weight and location of each item of equipment that can be easily removed, relocated, or replaced and that is installed when the airplane was weighed must be furnished.

14.19.2 Appropriate loading instructions for each possible loading condition between the maximum and minimum weights established must be furnished, to facilitate the center of gravity remaining within the established center of gravity limits.

APPENDIX

(Nonmandatory Information)

X1. DIFFERENCES FROM PART 23 AMENDMENT 62

X1.1 **Table X1.1** lists the changes to Part 23 Amendment 62 language and new requirements, with rationale for the differences.

TABLE X1.1 Differences from Part 23 Amendment 62

14 CFR 23 Source	Original	Revised	Rationale
General	FAA, the Administrator	Civil Aviation Authority, CAA	Per ASTM F44 guidelines to make the standard available to all civil aviation authorities.
23.771(b)	Where the flight crew are separated from the passengers by a partition, an opening or openable window or door must be provided to facilitate communication between flight crew and the passengers.	For each pilot compartment, where the flight crew are separated from the passengers by a partition, there must be a means to facilitate two-way communication between flight crew and cabin occupants, such as an opening or openable window or door or other means.	“opening or openable window or door” defines a design solution. Intent is to facilitate communication between crew and cabin. Designs other than door or opening may be acceptable.
23.771(new)		If communication between flight crew and cabin occupants relies on electrical power, the one-way communication from the flight crew to the cabin occupants must be considered an essential electrical load.	The means to facilitate two-way communication must be available under most flight conditions (except possibly emergency). If the means requires electrical power, it cannot be considered as a non-essential electrical load.
23.671(b)	Controls must be arranged and identified to provide for convenience in operation and to not create confusion and subsequent inadvertent operation.	Controls must be arranged and identified to provide for convenience in operation and to not create confusion and subsequent inadvertent operation, except where its function is obvious.	Added “except where its function is obvious” since some controls (e.g. yoke, rudder pedals) do not need to be labeled.
23.779(a)	Primary Controls: Aileron Elevator Rudder	Primary Controls: Roll Pitch Yaw	Changed from specific type of flight control surfaces to axis of flight that is being controlled.
23.777(a)	...and to prevent confusion and inadvertent operation	...and to not create confusion or be prone to inadvertent operation	Original wording is absolute and cannot be proven. Changed to clarify intent.
23.777(new)		Detents are an acceptable means to establish control positions associated with particular actions.	Clarify that detents are an acceptable means of compliance.
23.777(h)	Each fuel feed selector control must comply with Sec 23.995 and be located and arranged so that	Each fuel feed selector control must be located and arranged so that	Remove reference to 23.995, since the fuel feed selector must already comply with that requirement.
23.777(h)(3)		If there is a selector position other than “off” that does not provide adequate fuel flow for normal engine operation, these positions must be indicated in red and/or a red annunciation must be provided to the pilot.	23.777(h) says the “off” position must be red. Other positions (e.g. out of detent) may not be “off” but may restrict fuel flow. Any such positions must also be red.
23.779(b)(1) and 23.781(b)	“Supercharger”	“Forced Air Induction System”	Changed to be consistent with Powerplant terms.
23.1357(d)	If the ability to reset a circuit breaker or replace a fuse is essential to safety in flight, that circuit breaker or fuse must be so located and identified that it can be readily reset or replaced in flight.	For fuses identified as replaceable in flight, the spare fuse(s) must be readily accessible to a required pilot.	Separated the fuse requirement from circuit breaker requirements, and simplified the fuse requirement so there was no duplication with Specification F3061 .
Alerts (23.1309(d))		The assessment discussed in System Safety Requirements in Specification F3061 must be used to determine what failure conditions would become “unsafe system operating conditions” if the crew failed to take any action or observe appropriate precautions. Refer to terminology in Specification F3061 .	Added pointer to the system safety requirements so that alert requirements can be coordinated with the type of required actions based on safety assessments.

TABLE X1.1 *Continued*

14 CFR 23 Source	Original	Revised	Rationale
Alerts		For purposes of this requirement, an alert is considered appropriate if it can be shown to effectively alert the flight crew to the potential unsafe system operating condition in a timely fashion. The particular method of indication would depend on the urgency and need for flight crew awareness or action that is necessary for that particular failure. Inherent aircraft and/or system characteristics may be used in lieu of dedicated indications and annunciations if they can be shown to be timely and effective.	Clarifying language about appropriate alerting.
Alerts		Even if aircraft operation or performance is unaffected or insignificantly affected at the time of failure, information to the flight crew is required if it is considered necessary for the flight crew to take any immediate or subsequent action or observe any precautions.	Clarifying language about appropriate alerting.
Alerts		If aircraft operation or performance is unaffected or insignificantly affected, information and alerting indications may be inhibited during specific phases of flight where informing the crew is considered more hazardous than not informing them.	Clarifying language about appropriate alerting.
23.1322 Title	Warning, Caution, and Advisory Lights	Warning, Caution, and Advisory Lights or Indicators	Added “or Indicators” to account for technology that replicates the function of individual lights (e.g. electronic displays).
23.1322(b)	“amber”	“yellow/amber”	Currently approved electronic displays use yellow instead of amber. Added “yellow” as an acceptable color for caution indications.
23.1322(new)		Colors used per 11.2.1.4 should be consistently applied so as not create confusion with that color used elsewhere in the flight deck.	New language to encourage consistent use of colors across a cockpit.
23.1559(a)(2)	Deleted	Changed to “operation capabilities and limitations”.	Per NPRM proposed language, airplane categories will not be used. When wording was changed to be consistent with NPRM language, it became identical to 23.1559(c) and redundant with 23.1541(c).
23.1559(b)	“...certificated in more than one category,…”	“...certificated for multiple kinds of operations,…”	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1567(a)	“For normal category airplanes, there must be a placard in front of and in clear view of the pilot stating: “No acrobatic maneuvers, including spins, approved.” ”	“For airplanes not approved for acrobatic maneuvers, there must be a placard in front of and in clear view of the pilot stating flight maneuver information or limitations. (e.g. “No acrobatic maneuvers, including spins, approved”, “Acrobatic maneuvers are limited to the following ...”, “Spins Prohibited”, “Approved acrobatic maneuvers and related airspeeds:”).”	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1567(b)(1)	“For utility category airplanes, ...”	“For airplanes approved for limited acrobatic maneuvers, ...”	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1567(b)(2)	“...do not meet the spin requirements of acrobatic airplanes, ...”	“...do not meet spin requirements, ...”	Changed to be consistent with NPRM proposed language removing airplane categories.

TABLE X1.1 *Continued*

14 CFR 23 Source	Original	Revised	Rationale
23.1567(c)	"For acrobatic category airplanes, ..."	"For airplanes approved for acrobatic maneuvers, ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1567(d)	"For acrobatic category airplanes and utility category airplanes approved for spinning, ..."	"For airplanes approved for spinning, ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1581(b)(2)	"...do not apply to reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, provided that the following is met:"	"...do not apply to low speed Level 1 and 2 airplanes, if the following is met:"	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1583(a)	"The Airplane Flight Manual must contain operating limitations determined under this part 23,..."	"The Airplane Flight Manual must contain operating limitations determined for the airplane."	Removed reference to Part 23 to allow acceptance by multiple CAA.
23.1583(a)(3)	"In addition, for turbine powered commuter category airplanes,..."	"In addition, for high speed Level 3 and Level 4 airplanes, ..."	Changed to be consistent with NPRM proposed language removing airplane categories, and included high speed Level 3 airplanes where this requirement would also be applicable.
23.1583(c)(3)	"For reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, single-engine turbines, and multiengine jets 6,000 pounds or less maximum weight in the normal, utility, and acrobatic category,..."	"For low speed, Level 3 airplanes,..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1583(c)(4)	"For normal, utility, and acrobatic category multiengine jets over 6,000 pounds and commuter category airplanes,..."	"For high speed multiengine airplanes and Level 4 airplanes,..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1585(d)	"...for all normal, utility, and acrobatic category airplanes, ..."	"...for all Level 1, 2, and 3 airplanes, ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1585(e)	"...for all normal, utility, and acrobatic category multiengine airplanes, ..."	"...for all Level 1, 2, and 3 multi-engine airplanes, ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1585(f)	"...for normal, utility, and acrobatic category multiengine jets weighing over 6,000 pounds, and commuter category airplanes, ..."	"...for high speed multiengine airplanes and Level 4 airplanes ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1587(a)(1)	"...and the effect on these stalling speeds of angles of bank up to 60 degrees, must be furnished."	"...and the effect on these stalling speeds of angles of bank up to 60 degrees in a level turn, must be furnished."	Due to comment on the effect of AOA on stall speeds and bank angles, the Amendment 62 language was clarified to say that the stall speed/bank angle baseline relationship required by the regulation applies in a level turn.
23.1587(c)	"...for all normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, ..."	"...for Level 1, 2, and 3 airplanes, ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
23.1587(d)	"...for normal, utility, and acrobatic category multiengine jets weighing over 6,000 pounds, and commuter category airplanes, ..."	"...for high speed multiengine airplanes and Level 4 airplanes ..."	Changed to be consistent with NPRM proposed language removing airplane categories.
Appx G23.1(a)			This sentence is not included. The appendix G material within the context of the section makes this sentence unnecessary.

TABLE X1.1 *Continued*

14 CFR 23 Source	Original	Revised	Rationale
Appx G23.4	“The Airworthiness Limitations section is FAA approved and specifies maintenance required under Secs. 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.”	“The Airworthiness Limitations section is approved by the governing civil aviation authority, and specifies maintenance required under the governing Maintenance regulations and Operations regulations for Maintenance, Preventative Maintenance, Rebuilding, and Alteration, unless an alternative program has been approved by the governing civil aviation authority.”	Existing language was specific to the FAA. FAA was changed to “governing civil aviation authority”. References to 43.16 and 91.403 were changed to “governing Maintenance regulations (to cover 43.16) and Operations regulations (to cover 91.403) for Maintenance Preventative Maintenance, Rebuilding and Alteration” (subjects of the two referenced regulations).

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